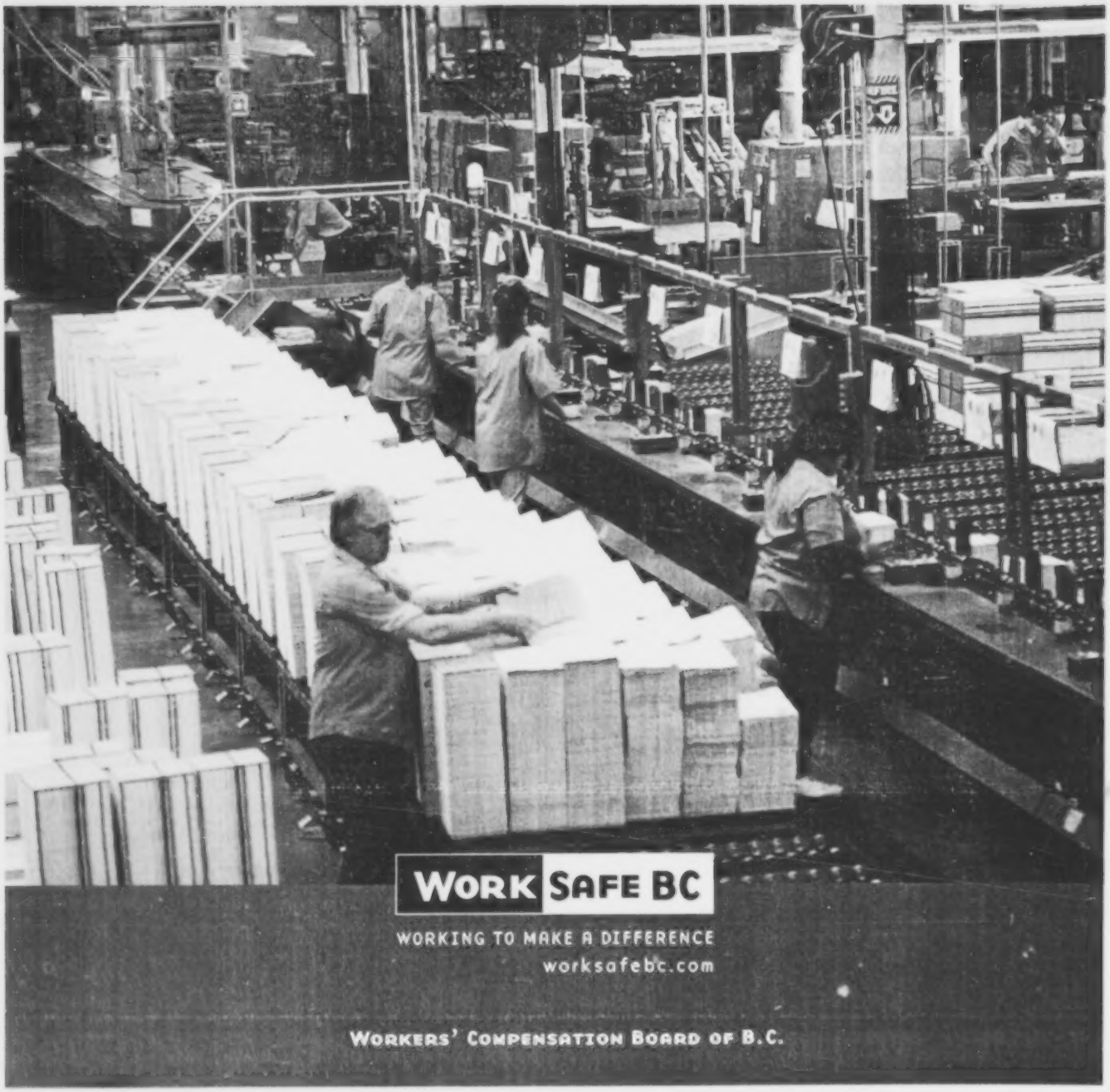
Understanding the Risks of Musculoskeletal Injury (MSI)

An educational guide for workers on sprains, strains, and other MSIs



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About the WCB

The Workers' Compensation Board is an independent provincial statutory agency governed by a Board of Directors. It is funded by insurance premiums paid by registered employers and by investment returns. In administering the *Workers Compensation Act,* the WCB remains separate and distinct from government; however, it is accountable to the public through government in its role of protecting and maintaining the overall well-being of the workers' compensation system.

The WCB was born out of a compromise between B.C.'s workers and employers in 1917 where workers gave up the right to sue their employers or fellow workers for injuries on the job in return for a no-fault insurance program fully paid for by employers. The WCB is committed to a safe and healthy workplace, and to providing return-to-work rehabilitation and legislated compensation benefits to workers injured as a result of their employment.

WCB Prevention Information Line

The WCB Prevention Information Line can answer your questions about workplace health and safety, worker and employer responsibilities, and reporting a workplace accident or incident. The Prevention Information Line accepts anonymous calls.

Phone 604 276-3100 in the Lower Mainland, or call 1 888 621-7233 (621-SAFE) toll-free in British Columbia.

To report after-hours and weekend accidents and emergencies, call 604 273-7711 in the Lower Mainland, or call 1 866 922-4357 (WCB-HELP) toll-free in British Columbia.

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WorkSafe BC
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WCB publications

Many publications are available on the WCB web site. The Occupational Health and Safety Regulation and associated policies and guidelines, as well as excerpts and summaries of the *Workers Compensation Act,* are also available on the web site: <www.worksafebc.com>

Some publications are also available for purchase in print:

Phone:	604 232-9704
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Fax:	604 232-9703
Toll-free fax:	1 888 232-9714
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Introduction

Some of the tasks we perform at work–such as lifting, reaching, and repeating the same movements–can strain our bodies. In some situations, these tasks can result in an injury to the muscles, tendons, ligaments, nerves, blood vessels, and joints of the neck, shoulders, arms, wrists, legs, and back. This type of injury is called a musculoskeletal injury, or MSI.

MSI is a common type of workplace injury in all industries in British Columbia. MSI claims resulting from overexertion and repetitive motion accidents account for about one-third of claims accepted by the WCB in British Columbia. In some industries, this proportion is much higher.

This guide is an educational booklet. It provides information to help workers, employers, and joint health and safety committees:

- Recognize the signs and symptoms of MSI
- Understand the potential health effects of MSI
- Identify the factors that place workers at risk for MSI

What is MSI?

The Occupational Health and Safety Regulation defines musculoskeletal injury (MSI) as an injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels or related soft tissue including a sprain, strain and inflammation, that may be caused or aggravated by work.

Signs and symptoms of MSI

It is important for employers and workers to recognize the early signs and symptoms of MSI. If treatment is needed, it can be started right away. You can also take steps in the workplace and outside it to avoid making the condition worse.

A *sign* can be observed, such as:

- Swelling
- Redness
- Difficulty moving a particular body part

A *symptom* can be felt but cannot be observed, such as:

- Numbness
- Tingling
- Pain

If you are experiencing signs or symptoms of MSI, inform your supervisor and report to the first aid attendant, if there is one.

Signs and symptoms of MSI may appear suddenly–for example, from a single incident that causes an injury–or they may appear gradually over a longer period. Don't ignore early signs and symptoms of MSI. You may need treatment or may need to take steps to prevent the injury from getting worse.

Potential health effects

An MSI can affect your ability to perform tasks at work and at home. Early signs or symptoms of MSIs can progress into conditions such as the following, which can have long-term effects:

- Muscle strains to the neck, back, shoulders, or legs
- Tendinitis (swelling of a tendon, a band of tissue that attaches muscle to bone)
- Carpal tunnel syndrome (pressure on a nerve in the wrist, resulting in numbness, tingling, pain, or weakness in the hand, wrist, or forearm)

Treatment

Treatment will vary according to the type of MSI. Treatment can include the application of cold or heat, medication, physical therapy, and even surgery. An MSI may be treated more effectively if it is discovered and reported early.

Risk factors

The factors that contribute to the risk of MSI are called risk factors. A risk factor is something that may cause or contribute to an injury. Two or more risk factors can be present at one time, increasing the risk of injury.

Workers may not always be able to identify all the risk factors in a task. However, it is important for workers to recognize situations when they are at higher risk. For example, if a worker must bend awkwardly to lift a heavy object in a cramped area, the worker will be exposed to a greater risk of MSI than a worker who uses a mechanical lifting device or one who has enough room to follow safe lifting procedures.

The primary risk factors for MSI are the physical demands of a task, including:

- Force
- Repetition
- Work posture
- Local contact stress

For each of these risk factors, it is important to consider duration (how long) and magnitude (how much). These are discussed on page 13.

Other risk factors that can affect these physical demands include:

- **Layout and condition of the workplace or workstation**–for example, a workstation that is too high or too low can create awkward working postures
- **Characteristics of objects handled**–for example, an object that is slippery or has no handles may cause awkward postures and require greater force to handle the object in a stable manner
- **Environmental conditions of the workplace**–for example, cold temperatures or drafts reduce blood flow to the hands and arms, requiring more grip force
- **Organization of work tasks**–for example, a worker performing a variety of different tasks throughout the day is likely at less risk of injury than a worker who has little variety and is exposed to the same risk factor for a longer time

The mere presence of MSI risk factors may not in itself result in an injury. It depends on, for example, how great the force is and how long the worker is exposed to the risk. It can also depend on individual characteristics that vary from worker to worker (such as height, gender, and the body's ability to deal with the risk factors).

The primary risk factors for MSI are explained on the following pages, along with examples and illustrations of some work activities that may expose workers to these risk factors. You will probably be able to identify the same risk factors in some of your activities outside the workplace.

Force

The force that a worker exerts on an object is a primary risk factor. Muscles and tendons can be overloaded when you apply a strong force against an object. Holding a lighter object (such as a mouse) for long periods can also expose workers to a risk of MSI.

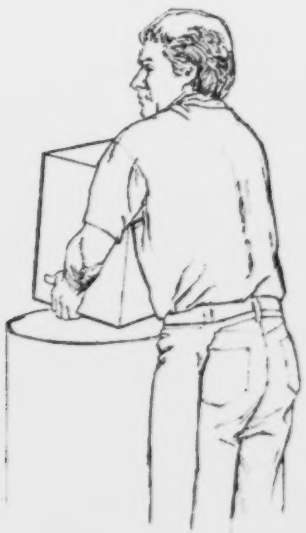
There are three types of activity that require force:

- Force involved in lifting, lowering, or carrying
- Force involved in pushing or pulling
- Grip force

The pictures on pages 4–7 illustrate these forces in different work activities.

Lifting, lowering, or carrying

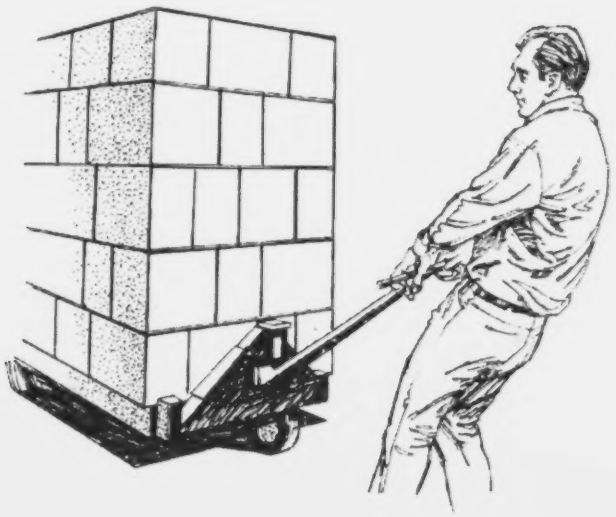
Lifting, lowering, or carrying an object or person requires force.



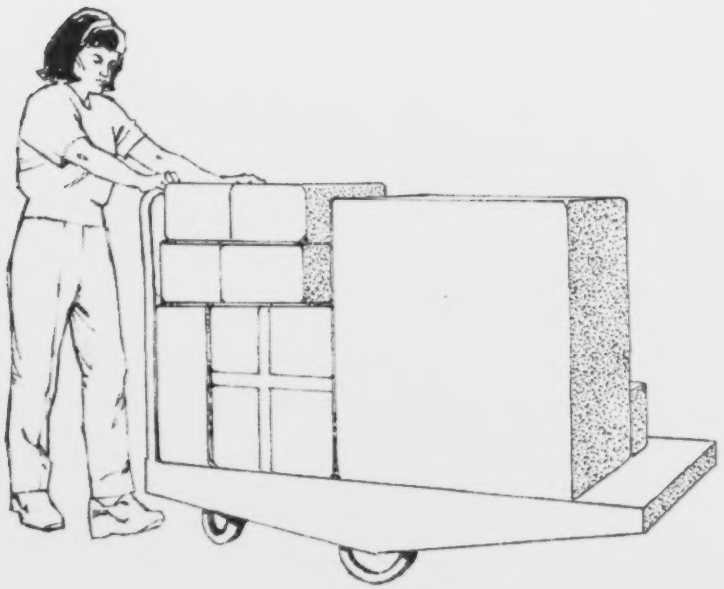
A worker needs to exert more force to lift a heavy object than a light one.

Pushing or pulling

Force is needed for pushing or pulling an object.



Pulling uses force to move a load.



Pushing may be less of a risk than pulling because it uses stronger back muscles.

Grip force

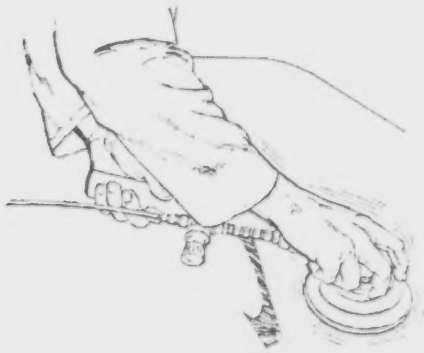
Additional grip force is needed in situations such as the following:

- The worker is gripping a small tool.
- The worker is handling slippery or odd-shaped objects that are difficult to hold.
- Objects are too large for a comfortable grip.
- Objects are grasped or handled using a pinch grip instead of a power grip.
- Vibrating tools or equipment are used.
- The worker is wearing heavy or bulky gloves that make gripping more difficult.
- Handles or grip spans are too large or too small.
- The handles on tools have an awkward shape.
- The worker's hands are cold.

The pictures on pages 6–7 show grip force in different work activities.

Pinch grip *Power grip*

The muscles tire more easily when the worker uses a pinch grip (left) rather than a power grip (right).



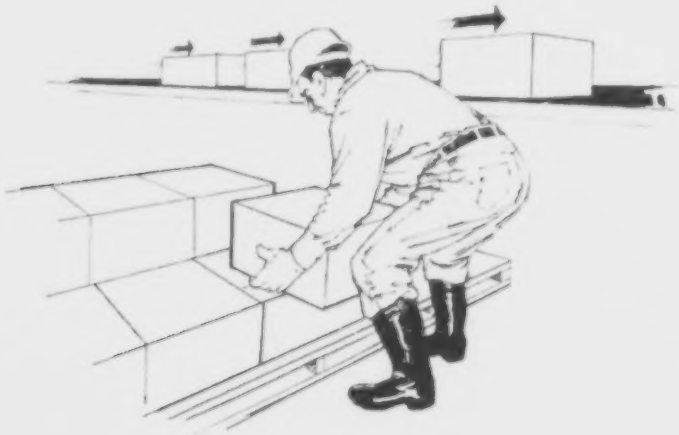
A worker may grip a vibrating tool (such as a sander) more tightly than a non-vibrating tool, using extra force.

The hand exerts force when gripping a small tool.

The hands exert additional grip force when handling slippery items.

Repetition

Repetition involves doing a task that uses the same muscles over and over with little chance for rest or recovery. This applies to both large muscles (see top picture below) and small muscles (see bottom picture below). Repetition puts workers at a higher risk of injury when other risk factors are also present (such as an awkward posture or heavy force).



Repeatedly lifting heavy boxes stresses the same body parts again and again.

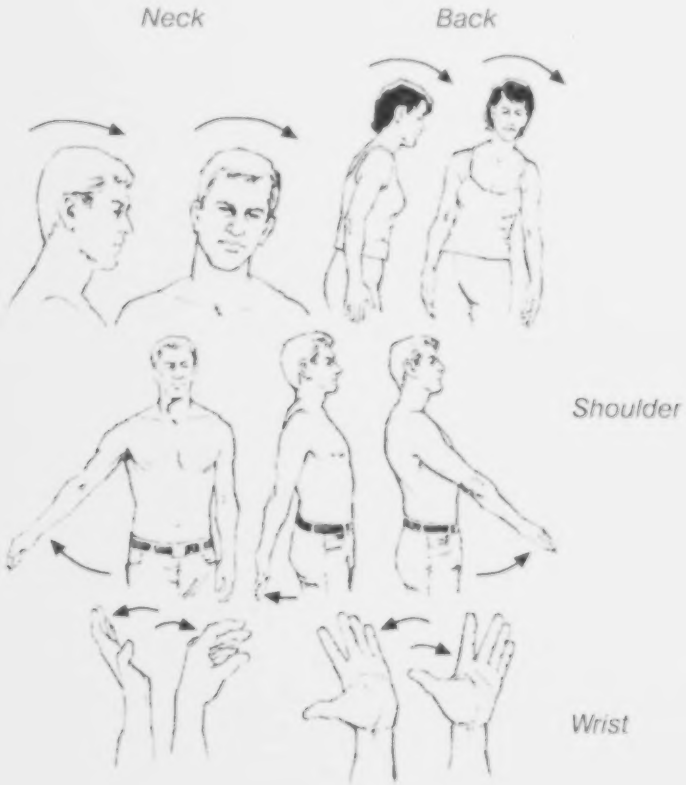
Turning boards or other heavy objects repeatedly uses the same arm and wrist muscles over and over again. If the wrist is in an awkward posture while the worker uses force for the repeated turning movement, the risk of MSI is increased.

Situations that increase the risk of MSI include the following:

- There is not enough variety in the worker's tasks to give muscles a rest or opportunity to recover.
- The worker is unaccustomed to the task–for example, when starting a new job or returning from a prolonged absence from work, or when the equipment or workstation has changed.

Work posture

Posture refers to the position of different parts of your body. Muscles, tendons, and ligaments must work harder and can be stressed when you are in an awkward posture. Awkward posture occurs when any joint of your body bends or twists excessively, outside a comfortable range of motion (see picture below). If the position is held long enough for you to feel aches and pains, then your muscles have been held in one position for too long. A posture held for a long time is called a static posture.

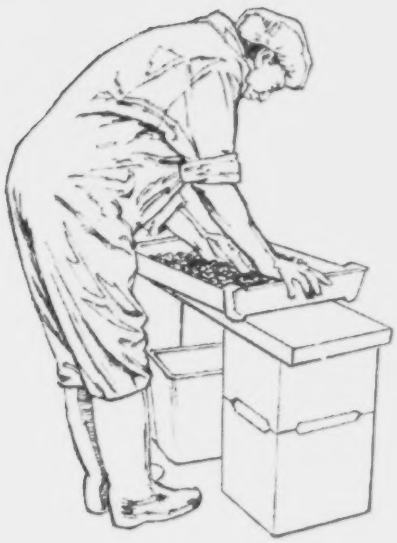


These drawings show a comfortable range of movement, where the body is in a good working posture.

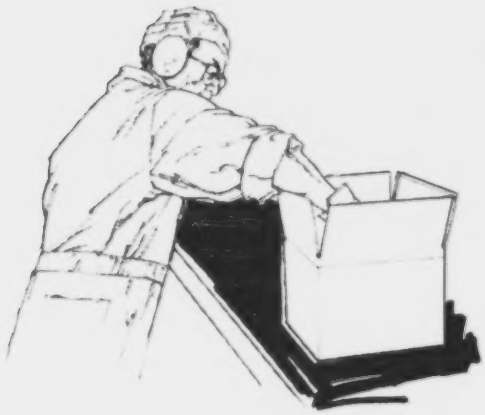
Various work activities can result in awkward postures:

- Leaning sideways, such as when reaching into a low drawer to one side (awkward back posture)
- Bending down to work at a low level (awkward back posture)
- Reaching overhead (awkward shoulder posture)
- "Flaring" the elbows out to the side (awkward shoulder posture)
- Bending the wrist when moving objects or keyboarding (awkward wrist posture)
- Bending the neck down, such as looking at small components in poor lighting conditions (awkward neck posture)
- Twisting part of the body, such as twisting the neck to view documents while keyboarding for a long time (awkward neck posture)

Reaching overhead puts the shoulders and neck into an awkward posture.



This worker is bent forward into an uncomfortable static posture while sorting berries.



Reaching over the top of the box places the shoulder in an awkward posture.

Bending the wrist while scanning groceries places the wrist in an awkward position.

The worker constantly twists his neck to read the poorly placed documents.

The effects of awkward posture can be made worse by:

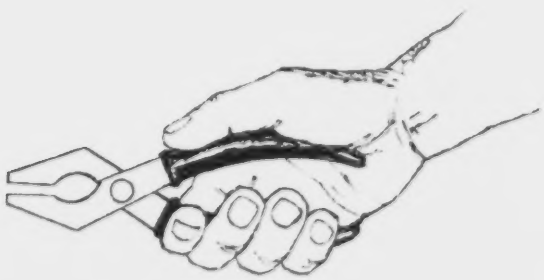
- Applying force in an awkward position, such as lifting a heavy object with arms above the body or using a strong grip with a bent wrist
- Holding an awkward position for a prolonged period (static posture), such as holding a telephone between the head and shoulder

This static posture with a bent neck is uncomfortable for the worker.

Local contact stress

Local contact stress occurs when a hard or sharp object comes in contact with the skin. The nerves and the tissues beneath the skin can be injured by the pressure. Here are some examples of activities that can result in local contact stress:

- Ridges and hard edges on tool handles digging into the hand
- Edges of work surfaces digging into the forearm or wrist
- Striking objects sharply with the hand, foot, or knee (such as striking the carpet stretcher with the area above the knee when laying carpet)



Local contact stress on the hands occurs when hard or sharp edges of a tool dig into the skin.

The effects of local contact stress can be made worse if:

- The hard object contacts an area without much protective tissue, such as the wrist, palm, or fingers
- Pressure is applied repeatedly or held for a long time

Leaning or resting the wrists on the edge of the desk can result in local contact stress.

Duration and magnitude

Duration, or "how long," should be considered along with the four primary risk factors listed on page 3 rather than separate from them. The amount of risk depends on how long (the total time in the work day) the worker is exposed to the risk factor. The person looking at risk factors should consider questions about duration for each factor:

- How long is the worker using force (for example, to lift or grip an object)?
- How long does the worker perform a repeated task?
- How long does the worker perform a task with an awkward body posture?
- How long is one part of the body exposed to local contact stress?

Magnitude, or "how much," should also be considered for each risk factor:

- How much force is the worker using?
- How fast is the worker doing the repeated movements?
- How severe is the awkward posture?
- How hard is the edge digging into the skin, causing local contact stress?

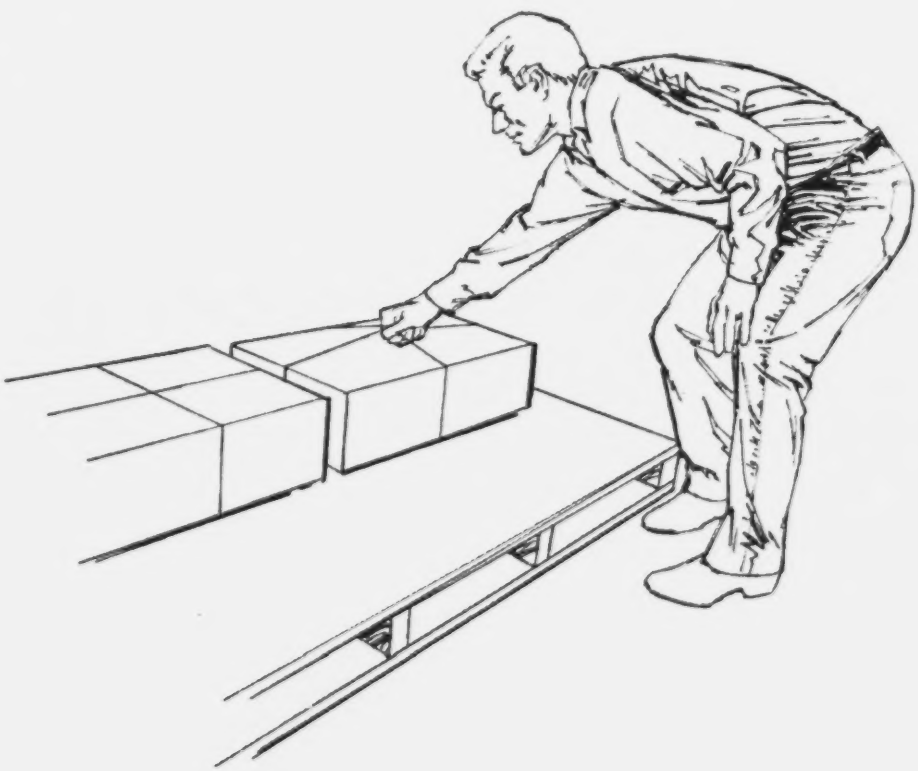
Multiple risk factors

More than one risk factor can occur at the same time. The more risk factors in the task, the greater the risk of injury. This example is used to show how several risk factors might occur at one time.

Task: A worker repeatedly bends to lift boxes from a pallet to a storage shelf.

Risk factors:

- Force–lifting the heavy weight of the box with one hand
- Awkward posture–worker bent forward at the waist
- Awkward posture–forward reach of right shoulder
- Local contact stress–worker grasping narrow plastic strapping
- Repetition–worker performing similar lifting task all day



Identifying risk factors

Employers are required to identify factors in the workplace that may expose workers to a risk of MSI. Employers must consult with the joint health and safety committee or the worker health and safety representative, if there is one, when doing this risk identification.

To start this process, employers need to identify jobs that present a higher risk of MSI. Then employers need to identify risk factors associated with each job according to priority, one job at a time.

Identifying jobs with a higher risk of MSI

To determine which jobs are at a higher risk for MSI and should be given priority, employers should examine first aid records and claims history for MSI. If workers have already had an MSI or they have signs or symptoms of MSI, their jobs will likely have a higher risk of MSI. Priority for risk identification should therefore be given to jobs in the following situations:

- A worker has already had a work-related MSI claim
- A worker reports to first aid with an MSI
- A worker has reported signs or symptoms of MSI

Risk identification must also take place *before* any problems or injuries are reported so that risk factors can be eliminated or minimized and injuries prevented. The employer might set priorities for preventive risk identification by interviewing workers, taking a survey, or observing workers on the job. In addition, paying attention to the following situations can help prevent injuries:

- A worker or supervisor observes high exposures to risk factors in a job–for example, during workplace inspections and observations of current work methods.
- A new job is introduced, or a process changes.

How employers can identify risk factors

After identifying particular jobs that pose a risk of MSI to workers, the employer needs to identify the MSI risk factors for each of those jobs. The employer must consult with the joint health and safety committee or worker health and safety representative about risk identification. The employer may also consult with workers, since they often know the job best.

There are several tools (such as checklists and worksheets) for identifying risk factors in a job available from a Board officer (see list of local WCB offices on the inside back cover). These tools help identify risk factors that require further investigation to assess the risk to workers. Some of these tools take duration and magnitude into account along with the risk factors to help the employer establish priorities for risk control.

Employers may use other methods to identify risk factors as long as they consider the risk factors listed in the Occupational Health and Safety Regulation.

How workers can help identify risk factors in their jobs

Workers can help in the process of identifying risk factors. Workers often have the best insights into the demands of their job and are in a good position to help identify risks and prevent MSI. Workers must report any work-related injuries and signs or symptoms of MSI without delay. If a worker reports an injury requiring medical attention or an unsafe condition that could lead to injury, the employer must investigate. An investigation will help to identify risk factors that contributed to the injury or condition and lead to implementing controls to eliminate or minimize the risk factors.

Think about your job and all the different duties. For each duty, try to identify which, if any, of the four primary risk factors (force, repetition, work posture, local contact stress) are present. Then consider these questions:

- Does the total time (duration) you spend doing a particular duty increase the physical demands on your body?
- Do any of the following increase the physical demands on your body?
  - Layout of your workplace or workstation (such as work surfaces that are too high or too low or that result in excessive reaching distances)
  - Characteristics of the objects you handle (such as objects that are too large to handle or that have their weight unevenly distributed)
  - Environmental conditions (such as an atmosphere or objects cold enough to make the hands cold while the worker handles objects)
  - Organization of your work duties (such as a lack of variety of tasks, with the result that your muscles do not have a chance to rest and recover)

After you answer these questions, you will have a fairly good idea of what risk factors you are exposed to in your work. You can probably see which duties place you at the most risk of MSI and where changes are most needed.

You may also have some suggestions for practical solutions to reduce or eliminate some of the these risk factors. Discuss your answers and suggestions with your supervisor. You might also talk to members of the joint committee or your worker health and safety representative about the risks of MSI.

Key questions

If you may be exposed to a risk of MSI in your job, you must be educated in risk identification related to your work. This includes recognizing the early signs and symptoms of MSI and their potential health effects. Based on the information in this guide, you should be able to answer the following questions:

- What are some early signs and symptoms of MSI?
- What person would you report these signs and symptoms to?
- What can happen if you ignore early signs and symptoms of MSI?
- What are the risk factors in your job that could lead to MSI?

What comes next?

Risk identification is just one step in eliminating or minimizing the risk of MSI to workers. Once risk factors have been identified, the employer must do a risk assessment to find out how great the risk is. Not all risk factors are necessarily severe enough or occur for a long enough time to cause or contribute to an injury.

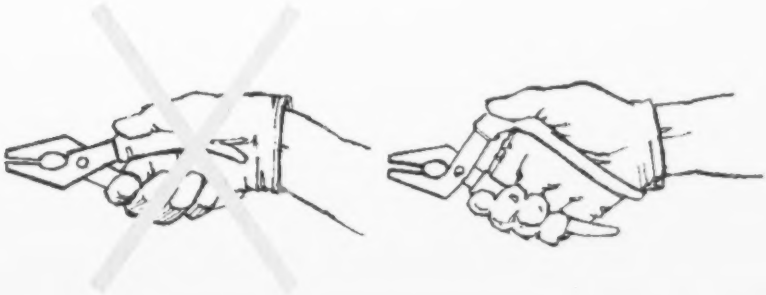
Risk assessment should be carried out by people who understand the work process, the MSI risk factors, and the principles of risk assessment and control. When doing a risk assessment, the employer must consult with workers who have signs or symptoms of MSI and with a representative sample of workers who carry out the work being assessed. The sample should include workers who represent a range of characteristics such as gender, age, and height.

The risk assessment may determine that control measures are needed to eliminate or minimize the risk. Some examples of control measures are mechanical lifting devices, adequate recovery time from repetitive tasks, adjustable workstation heights, and padding on sharp edges of work surfaces. See the pictures on pages 18–19 for some examples of controls.

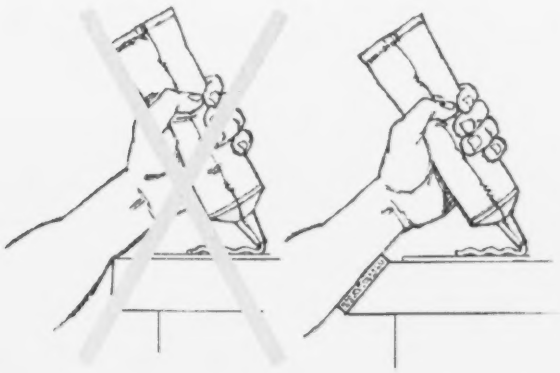
Workers may also need to be trained in safe work procedures for some tasks, such as adjusting their workstation to fit the task correctly. If the employer provides any mechanical aids (such as a lifting device) or any personal protective equipment (such as knee pads), workers must be trained to use them. Workers have a responsibility to follow safe work procedures and use equipment they have been trained to use.

Left: A pistol handle used in this position puts the wrist and shoulder into awkward postures.
Right: The suspended in-line tool allows a power grip with a straight wrist.

The right work height and angle keep the shoulder in a more comfortable position.



Tools with angled handles keep the wrist straight.



A padded and angled edge prevents local contact stress.

Getting assistance

The WCB web site <www.worksafebc.com> has a health and safety centre with ergonomics as a topic. Visit the site for more information on MSI and for links to other ergonomics sites.

The following WCB publications include information about MSI topics. These publications are all available on the WCB web site. Some are available in print (see page ii for ordering information).

- *Back Talk: An Owner's Manual for Backs*
- *Constructive Ideas: Innovative Ideas to Reduce Soft Tissue Injuries in the Construction Industry*
- *Ergonomic Commentary 1: Back Belts*
- *Ergonomic Commentary 2: Wrist Braces*
- *Ergonomic Commentary 3: PC Mouse*
- *How to Make Your Computer Workstation Fit You*
- *MSI Prevention Bulletins*
- *Preventing Musculoskeletal Injury (MSI): A Guide for Employers and Joint Committees*
- *Preventing Tree Planting Injuries*

The WorkSafe™ Education Network offers a course on preventing and investigating MSI. This course is offered in various school districts and community colleges. For information on this course, call the campus in your area or call the WCB at 604 276-3100 in the Lower Mainland or toll-free in B.C. at 1 888 621-SAFE (7233).

If you have questions about health and safety requirements, you can call the WCB Prevention Information Line at 604 276-3100 in the Lower Mainland or toll-free in B.C. at 1 888 621-SAFE (7233).

A Board officer can give further guidance on how to prevent MSI at your workplace and provide some tools such as checklists for risk identification and assessment. See the list of local WCB offices on the inside back cover.

WCB offices

Visit our web site at <www.worksafebc.com>.

Abbotsford
2774 Trethewey Street V2T 3R1
Phone 604 276-3100
1 800 292-2219
Fax 604 556-2077

Burnaby
450 – 6450 Roberts Street V5G 4E1
Phone 604 276-3100
1 888 621-7233
Fax 604 232-5950

Coquitlam
104 – 3020 Lincoln Avenue V3B 6B4
Phone 604 276-3100
1 888 967-5377
Fax 604 232-1946

Courtenay
801 30th Street V9N 8G6
Phone 250 334-8765
1 800 663-7921
Fax 250 334-8757

Kamloops
321 Battle Street V2C 6P1
Phone 250 371-6003
1 800 663-3935
Fax 250 371-6031

Kelowna
110 – 2045 Enterprise Way V1Y 9T5
Phone 250 717-4313
1 888 922-4466
Fax 250 717-4380

Nanaimo
4980 Wills Road V9T 6C6
Phone 250 751-8040
1 800 663-7382
Fax 250 751-8046

Nelson
524 Kootenay Street V1L 6B4
Phone 250 352-2824
1 800 663-4962
Fax 250 352-1816

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400 – 224 Esplanade Ave. W. V7M 1A4
Phone 604 276-3100
1 888 875-6999
Fax 604 232-1558

Prince George
1066 Vancouver Street V2L 5M4
Phone 250 561-3700
1 800 663-6623
Fax 250 561-3710

Surrey
100 – 5500 152 Street V3S 5J9
Phone 604 276-3100
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4450 Lakelse Avenue V8G 1P2
Phone 250 615-6605
1 800 663-3871
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Victoria
4514 Chatterton Way V8X 5H2
Phone 250 881-3418
1 800 663-7593
Fax 250 881-3482

Head Office / Richmond
Prevention Information Line:
Phone 604 276-3100
1 888 621-7233 (621-SAFE)
Administration:
6951 Westminster Highway
Phone 604 273-2266
Mailing Address:
PO Box 5350 Stn Terminal
Vancouver BC V6B 5L5

After Hours
Health & Safety Emergency
604 273-7711
1 866 922-4357 (WCB-HELP)

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